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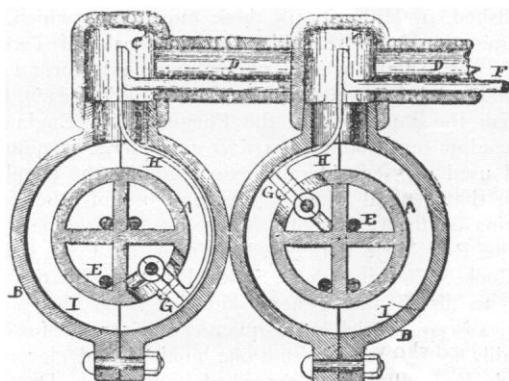
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for the filthy water supplied to almost half the people of the State, it is of incalculable value, and there should be no delay in securing its health-giving benefits.

The artesian wells bored at various points on the Atlantic coast between Sandy Hook and Cape May continue to yield a supply of good and wholesome water, and some very satisfactory ones have been sunk along the Delaware.

THE MEDBERY UNDERGROUND SYSTEM.

WE have to record this time another instance of the moving in cycles of human progress. As the first water-pipes for distributing water through towns were made of wood, to be afterwards made of iron and iron and cement, so now an inventor has produced a wooden pipe, not necessarily for use in conveying water, but more especially for use as a conduit for electric conductors. This pipe is made from long wood fibres, separated, washed free from saps and gums, and then moulded while in a pulpy state into the requisite size and shape, being subjected to great hydraulic pressure. After this it is treated and hardened by a chemical process, that, it is believed, renders it impervious to moisture, acids, or gas. The piping looks not unlike iron, but is, of course, much lighter, and is made in sections which can be joined by threads, like iron pipes, with a sleeve coupling. The pipes can be made continuous, thus preventing gases or moisture coming in contact with the enclosed wires. Each conduit is divided into four or more compartments,

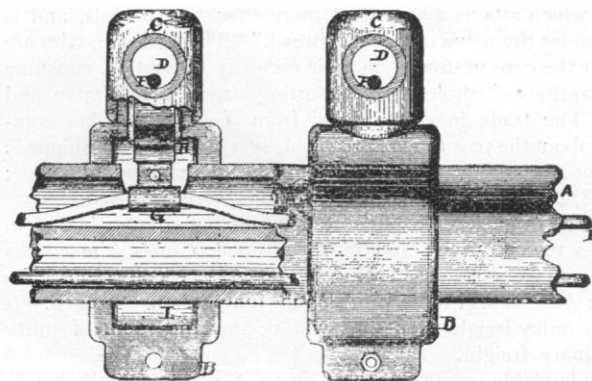


being properly cemented. The branch wire is then connected with the extension from the clamp *H*, and, when it has been passed through the first length of the branch conduit *F*, the branch conduit is screwed into the threaded hole in the side of the cap *C*, or, preferably, cemented into place. The branch line can thus be extended as far as may be desired. Thus far in the process, connection has been made with one wire only, either the negative or the positive wire, but of course the connection with the other wire will be made in a similar manner.

The system as above outlined is being introduced by the American Indurated Fibre Company of Mechanicsville, N.Y., from whom further information may be obtained. It may be mentioned that satisfactory practical work with it has been done by the Bell Telephone Company of Philadelphia, the Pennsylvania Railroad Company, and other parties.

EDIBLE MUSHROOMS OF THE UNITED STATES.

FOR several years past the division of microscopy of the United States Department of Agriculture has been in receipt of numerous letters from regular correspondents and others, from which it appears that in various localities, representing almost every section and climate of the Union, there are found large quantities of edible mushrooms and other allied fungi; few of which, however, are utilized, owing to the inability of the great majority of the people to distinguish the edible species from the poisonous ones. To ob-



FIGS. 1 AND 2.—THE MEDBERY UNDERGROUND SYSTEM.

as shown in the illustrations; and the wires occupy separate ducts, which precludes the possibility of cross-circuits. The question of insulating wires is one of considerable importance, and the expenditure is necessarily very great; but in this conduit, by reason of the high insulating power of the material, expensive insulation of the wires is avoided.

Another noteworthy feature of this system is the method of distributing to houses and street-lamps. Usually it is necessary to make provision for this when laying the conduit, which is necessarily very expensive; but by this system side taps and connections can be as easily made at any time after the conduit is laid, and without serious expense, as will be explained from the accompanying illustrations, Figs. 1 and 2.

When desiring to make connection with the main line, the conduit is exposed at any point, and an opening is cut in it in any preferred manner. It is usually drilled. The wire is then lifted from its resting-place in the conduit, through the hole in the conduit; and the two parts of the metallic clamp *G*, being first separated, are put over the wire, and firmly attached thereto by means of a screw. The clamp has a chamber into which a suitable metal or solder is melted or fused, making a perfect contact and permanent joint. The two sides of the casing or connecting box (which, it will be seen, has a recess or hollow interior) may be filled with suitable insulating-cement while in a plastic state, and they are then placed about the conduit in such a manner that the extension of the clamp *H* projects through the neck of the casing, as shown in the cut. The bolts are then inserted in the lips of distributing-duct *B*, and screwed up. The cap *C* is then applied, and forced firmly down upon the tapering neck of the casing, after

tain some clear and trustworthy criteria by which to make this essential distinction has been the object of the various communications received; and in view of the highly nutritious properties of this class of esculents, and of the great possible value of their aggregate product as indicated by the vast quantities produced in countries where attention is given to their cultivation, the importance of a satisfactory answer to these inquiries will be readily appreciated. This answer is given in a little pamphlet on twelve edible mushrooms of the United States, illustrated with twelve colored types, by Thomas Taylor, M.D., microscopist of the Department of Agriculture, Washington, D.C.

Rollrausch and Siegel, who claim to have made exhaustive investigations into the food-values of mushrooms, state that "many species deserve to be placed beside meat as sources of nitrogenous nutriment;" and their analysis, if correct, fully bears out the statement. They find, in 100 parts of dried *Morchella esculenta*, 35.18 per cent of proteine; in *Helvella esculenta*, 26.31 per cent of proteine, from 46 to 49 per cent of potassium salts and phosphoric acid, 2.3 per cent of fatty matter, and a considerable quantity of sugar. The *Boletus edulis* they represent as containing in 100 parts of the dried substance 22.82 per cent of proteine. The nitrogenous values of different foods, as compared with the mushroom, are stated as follows: "proteine substances calculated for 100 parts of bread, 8.03; of oatmeal, 9.74; of barley-bread, 6.39; of leguminous fruits, 27.05; of potatoes, 4.85; of mushrooms, 33.0." A much larger proportion of the various kinds of mushrooms are edible than is generally supposed, but a prejudice has grown up concerning them in this country which it will take some time to eradicate. Notwithstanding the occurrence of occasional fatal ac-

cidents through the inadvertent eating of poisonous species, fungi are largely consumed, both by savage and civilized man, in all parts of the world; and, while they contribute so considerable a portion of the food-product of the world, we may be sure their value will not be permanently overlooked in the United States, especially when we consider our large accessions of population from countries in which the mushroom is a familiar and much-prized edible.

In France mushrooms form a very large article of consumption, and are widely cultivated. Mushroom-beds are cultivated in caves, frequently miles in extent. A cave at Mery is mentioned as containing, in 1867, twenty-one miles of beds, and producing not less than three thousand pounds daily. Another at Frepillon contains sixteen miles of beds. The catacombs and quarries of Paris and vicinity, and the caves of Moulin de la Roche, Sous Bicetre, and Bagneux, produce immense quantities of mushrooms. They are all under government supervision, and are regularly inspected, like the mines.

The mushroom which is cultivated in these quarries and caves, almost to the exclusion of all others, is the "Snow-Ball" (*Agaricus arvensis*). The truffle is held in high esteem, and is largely exported. In 1872 the quantity of truffles exported from France was valued at over 3,000,000 francs; in 1879, at nearly 10,000,000 francs. Immense quantities of the *Agaricus deliciosus* are sold in the Marseilles markets. The *Fistulina hepatica* is also in great demand, and many other varieties appear from time to time in the markets throughout France. The natives of Australia use largely a truffle which attains a weight of more than two pounds, and is known under the name of "native bread." The Chinese, who are noted for the care bestowed on their esculent vegetation, consume large quantities of edible fungi, importing largely from Japan and Tahiti. The trade in edible fungi from Tahiti to China commenced about the year 1866; in 1868 only seventy tons were shipped; in 1873 one hundred and thirty-five tons were exported to China; and in 1874 one hundred and fifty-two tons were exported.

The value of mushrooms imported by Shanghai from Tahiti in 1872 was 107,000 taels; and in 1873, 138,800 taels (the tael is worth about six shillings sterling). The fungus shipped, *Exidia auricula Indæ* is said to be very rich in fungine and nitrogen. It is a very bulky freight: ten tons will occupy the room of thirty tons ordinary freight.

A very laudable practice of the Chinese Government alluded to in an English journal, and which might perhaps be advantageously adopted in this country, is the publishing, for annual gratuitous distribution, of numerous treatises describing the different herbs which can be utilized in whole or in part for food-purposes. One of these treatises is called the "Anti-Famine Herbal," and consists of six volumes, containing descriptions, with illustrations, of over four hundred plants which can be used as food. These volumes are of inestimable value in districts where the ravages of insects, drought, etc., have destroyed the grain and rice crops, and famine is imminent. For some years past New Zealand has exported large quantities of an edible fungus to San Francisco and Hong Kong for the use of the Celestials. A full account of this industry may be obtained from the United States consular reports. The gathering and drying of the fungus gives profitable employment to large numbers of colonial children, as well as to the Maoris. The species grows abundantly in the wooded regions of New Zealand, and when dry is worth from fourpence to fivepence a pound. The Chinese, who are singularly free from prejudice in the matter of food, use it, as they do the edible swallow's nest, as a chief ingredient in their favorite soup. They also employ it as a medicine, and, stranger still, for making a valuable dye for silk. Another remarkable edible fungus of New Zealand is the *Sphæria Robertsii*, which grows out of the body of a large caterpillar, practically converting the latter into vegetable substance. The caterpillar lives under ground, and the fungus springs upwards through the soil till it reaches a height of eight or ten inches. It is eaten by the Maoris, who employ it also, when burned, as a coloring-matter.

The Japanese grow several species of edible fungi in logs of decaying wood in a manner peculiar to themselves; and, aside from the home consumption, they in one year exported to China mushrooms to the value of \$60,000. In 1879 mushrooms were exported

from Japan to the value of 243,440 yens. The yen is equal to 99 $\frac{7}{10}$ cents. Among the north-eastern tribes of Asia, fungi are largely used as food. One species, when pounded, forms their snuff; while another, the *Fly Agaric*, which is utilized in Europe as a fly-killer, and is regarded as one of the most poisonous forms, is used by them as a substitute for ardent spirits, one large specimen being sufficient "to produce a pleasant intoxication for a whole day." In many parts of Europe fungi are a favorite food, being eaten fresh, and also preserved in vinegar for winter use. For pickling purposes, all kinds, it is said, are gathered, the vinegar being supposed to neutralize the alkaline poison of the noxious species. The common mushroom, the morel, and the truffle, are, however, the favorite edible fungi. In Italy the value of the mushroom as an article of diet has long been understood and appreciated. Pliny, Galen, and Dioscorides mention various esculent species, notably varieties of the truffle, the boletus, and the puffball. At Rome it has been the custom of the government to appoint inspectors to examine all the mushrooms brought into market, and to reject such as are poisonous or worthless, which are thrown into the Tiber. It was required also that no mushrooms should be hawked about the streets, but that all should be sent to the central depot for inspection.

The yearly average of the taxed mushrooms sold (all over ten pounds being taxed) in the city of Rome alone, for the past decade, has been estimated at between sixty thousand and eighty thousand pounds weight. Large quantities of mushrooms are consumed in Germany, Hungary, Russia, and Austria, and in the last country a list is published, by authority, of those mushrooms which, upon official examination, may be sold. Darwin speaks of Terra del Fuego as the only country where cryptogamic plants form a staple article of food. A bright yellow fungus allied to *Bulgarin*, forms, with shell-fish, the staple food of the Fuegians. In England the common meadow mushroom, *Agaricus campestris*, is quite well known, and used to a considerable extent among the people, but there is not that general knowledge of and use of other species which obtains on the Continent. Much has been done of late years by the Rev. M. J. Berkeley, Dr. Curtis, Dr. C. D. Badham, Dr. M. C. Cooke, Worthington G. Smith, Professor Charles Peck, and others, to disseminate general knowledge on this subject. That America is no less rich in the quantity and variety of esculent fungi is readily seen by the fact that one hundred and eleven species of edible fungi have been described by the Rev. Dr. Curtis, State botanist of North Carolina, as indigenous to that State alone, and late investigations show that nearly all the species common to the countries of continental Europe are found in different localities in the United States. Dr. J. J. Brown of Sheboygan, Wis., writes that edible mushrooms are found in his neighborhood in great abundance.

Many methods of cultivating the common meadow mushroom have been presented by different growers, but all agree as to the value of the general methods in practice. Nearly every farm and nursery affords the conditions necessary to cultivate the ordinary field-mushrooms; such as sheltered sheds, stables, and small hot-beds for winter cultivation, and melon-patches, cucumber-pits, etc., for summer culture.

Mushroom spawn in "bricks" can be easily obtained from the seedsmen. Natural or virgin spawn, which is considered by many experienced growers as preferable to the artificial, can be obtained in most places where horses are kept. It is found in half-decomposed manure-heaps, generally where horse droppings have accumulated under cover. It is readily distinguished by its white filamentous character and by its mushroom odor. When dried, it can be kept for years.

Mushroom-beds are easily formed on the floors of sheds by carrying in the fresh stable-dung, adding to it about one-fourth of good loam, mixing both together, pressing firmly down, and letting the mass remain about two weeks untouched. By this time the temperature will be on the decline; and when it falls anywhere between 50° and 60° F., break the spawn bricks into pieces two inches square, and plant twelve inches apart, three inches below the surface. By means of any suitable instrument, beat the mass down firmly, then add three inches of good soil, and beat again.

For culinary purposes, mushrooms should generally be allowed a

growth of about six weeks, and when gathered should be carefully cut off with a knife, not broken.

It is recommended that mushroom-beds should not be finally earthed until the spawn is seen beginning to spread its white filaments through the mass; and should it fail to do this in eight or ten days after spawning, the conditions being favorable, it is better to insert fresh spawn or to remake the bed, adding fresh materials if it be found to fail from being too cold. The temperature of the beds at spawning-time should not exceed 80° F.: 70° F. is considered the most suitable regular temperature. It is advisable not to put the spawn at any uniform depth, but so that while one piece of it may be at a depth of six inches, or nearly so, others may touch the surface. This allows the spawn to vegetate at a depth and temperature most congenial to it. Mushrooms may be cultivated in warm cellars, in boxes about four feet square by eighteen inches in depth, for family use.

MINERAL PRODUCTS OF THE UNITED STATES.

THE sixth report on "The Mineral Resources of the United States," by David T. Day, chief of the division of mining statistics and technology, United States Geological Survey, is to be issued shortly. This report is for the calendar year 1888, and contains detailed statistics for this period, and also for preceding years, together with much descriptive and technical matter. The following are the totals of the production of the more important mineral substances in 1888:—

Metals.

Iron and Steel.—The principal statistics for 1888 were: domestic iron ore consumed, about 12,060,000 long tons; value at mines, \$28,944,000. This is an increase over 1887 in quantity of 760,000 tons, but a decrease in value of \$4,956,000. Imported iron ore consumed, 587,470 long tons; total iron ore consumed in 1888, about 12,650,000 long tons, or 150,000 tons more than in 1887. Pig-iron made in 1888, 6,489,738 long tons; value at furnace, \$107,000,000. This is an increase over 1887 of 72,590 tons in quantity, but a decrease of \$14,925,800 in value. Steel of all kinds produced in 1888, 2,899,440 long tons; value at works, \$89,000,000. This is a decrease from 1887 of 439,631 tons in quantity, and of \$14,811,000 in value. Total spot value of all iron and steel made in 1888, in the first stage of manufacture, excluding all duplications, \$145,000,000, a decrease of \$26,103,000 as compared with 1887. Limestone used as a flux in the manufacture of pig-iron in 1888, about 5,438,000 long tons; value at quarry, about \$2,719,000.

Gold and Silver.—According to the director of the mint, the gold product was 1,604,927 fine ounces, valued at \$33,175,000. This is about the same as in 1887, being an excess of only \$75,000. The silver product was 45,783,632 fine ounces, of the commercial value of about \$43,000,000, and of the coining value of \$59,195,000. This is an increase of 4,515,327 ounces over the product in 1887. In addition to the product of our own mines, some 10,000,000 ounces of silver were extracted in the United States from foreign ores and bullion.

Copper.—The total product, including the yield of imported ores, increased to 231,270,622 pounds, or 115,635 short tons, during 1888, which is 46,053,291 pounds more than the product of 1887. During the first quarter of 1889 the production was increasing at even a more rapid rate. The prices received by American producers averaged 15.5 cents per pound for Lake copper, 14.5 for Arizona, and 14 for other districts, making the total value 33,833,954. Montana led in the production, making 97,897,968 pounds. Consumption was somewhat reduced by the high prices.

Lead.—The product increased to 180,555 short tons from 160,700 tons in 1887. The increase was due principally to the heavier receipts of lead in Mexican silver-lead ores from 15,000 tons in 1887 to over 27,000 tons in 1888. The average price in New York was 4.41 cents per pound. The production of white lead, chiefly from pig-lead, was 89,000 short tons, valued at \$10,680,000.

Zinc.—The erection of new works and the extension of old ones led to a further notable increase in the production of zinc in 1888. The additions to capacity were fairly uniformly distributed in the

West, East, and South. Production in 1888, 55,903 short tons, with a total value of \$5,500,855; in 1887, 50,340 tons, worth \$4,782,300. The production of zinc white in 1888, directly from ores, was 20,000 short tons, worth \$1,600,000.

Quicksilver.—The product was 33,250 flasks (of 76½ pounds each) from California, a decline in that State of 510 flasks from 1887, in spite of a very satisfactory price, which averaged \$42.50 per flask, making the total value \$1,413,125. No new valuable deposits were discovered in 1888, and without them it is not probable that the yield of quicksilver will increase.

Nickel.—The industry remains unchanged except for indications of further developments at Lovelock in Nevada, and Riddle in Oregon. The product includes 190,637 pounds of metallic nickel, valued at \$114,382 at 60 cents per pound, and 4,545 pounds, worth \$1,136, exported in ores and matte. Total value, \$115,518. The corresponding value in 1887 was \$133,200.

Cobalt Oxide.—The total product, including the contents of the exported ores and matte, was 12,266 pounds, worth \$18,441. In 1887 the total was 18,340 pounds, worth \$18,774, the lower rate of value in that year resulting from a larger proportion of exported nickel in matte and ore. The price of cobalt oxide remained at \$2 per pound.

Chromium.—The product declined from 3,000 tons in 1887 to 1,500 tons in 1888. The average price in San Francisco remained \$15 per ton. Increased operations are probable in 1889.

Manganese.—The product of manganese and manganiferous iron ores in the United States in 1888 was 239,460 tons, valued at \$876,215. Of this amount, some 25,500 tons would be classed as manganese ores; the remainder, as manganiferous iron ores. Of the manganiferous iron ores, 11,462 tons averaging 11 per cent of manganese, and 189,574 tons averaging 4 per cent of manganese, were from the Colby Mine, Michigan. In addition to the above, some 60,000 tons of argentiferous manganese ores, valued at \$10 a ton, chiefly for the silver contained in them, were produced in the Rocky Mountain region.

Aluminum.—The past year was more promising than ever before for the production of cheap aluminum. The production of metallic aluminum as an industry distinct from the production of alloys began toward the close of the year, and 500 pounds had been made up to Dec. 31. The production of 3,000 pounds since then indicates that the industry may continue. The exact amount of alloys produced by the Cowles process has not been furnished, but was not markedly different from the product of 1887, when 18,000 pounds of aluminum contained in bronze and ferro-aluminum were produced. The price for metallic aluminum declined to as low as \$4.50 per pound for less favored brands.

Platinum.—Including the platinum and iridium separated from gold by the assay offices and that saved in placer gold-mining, the product was about 500 ounces, valued at \$2,000.

Fuels.

Coal.—The total production of all kinds of commercial coal in 1888 was 142,037,735 short tons (increase over 1887, 18,022,480 tons), valued at the mines at \$204,221,990 (increase, \$30,625,994). This may be divided into Pennsylvania anthracite, 43,922,897 short tons (increase, 4,416,642 short tons), or 39,216,872 long tons, including 38,145,718 long tons shipped by the railroads and canals and reported by their statistician, Mr. John H. Jones, and 1,071,154 long tons sold to the local trade at the mines (increase, 3,943,430 long tons), valued at \$85,649,649 (increase, \$6,284,405); all other coals, including bituminous, brown coal, lignite, small lots of anthracite produced in Colorado and Arkansas, and 4,000 tons of graphitic coal mined in Rhode Island, amounting in the aggregate to 98,114,838 short tons (increase, 13,605,838 tons), valued at \$118,572,341 (increase, \$24,341,589).

The colliery consumption at the individual mines varies from nothing to 8 per cent of the total output of the mines, being greatest at special Pennsylvania anthracite mines, and lowest at those bituminous mines where the coal-bed lies nearly horizontal, and where no steam-power or ventilating-furnaces are used. The averages for the different States vary from 2 to 6.4 per cent; the minimum average being in the Pennsylvania bituminous, and the maximum average being in the Pennsylvania anthracite region.